POSTERIOR COMPOSITE RESIN RESTORATIONS

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OUTLINE

- HISTORY
- ADA STATEMENT-1998
- MATERIAL CONSIDERATIONS
- CASE SELECTION
- NEW MATERIALS
- OPERATIVE CONSIDERATIONS
- MATRICES
- COMPOSITE PLACEMENT
- FINISHING TECHNIQUES
- WEAR CONSIDERATIONS

HISTORY

- First recommended over 25 years ago for posterior use.

- **1960's: Adaptic and Concise**.
- **1980's: 3-M Products: P-10 and P-30.**
- **1980'S: microfill composites (.04 um).**
  - Advantages: polishability, wear resistance & color stability.
  - Disadvantages: low flexural/tensile strength, localized wear & thus limited uses posteriorly.

HISTORY

- 1986: Heliomolar:

- **The sole exception to the microfill group of resins that were introduced for posterior use.**

- **70% filled anterior/posterior microfill resin.**
- **Very good wear characteristics.**
- **Less than perfect esthetics.**

HISTORY

- Mid-1980's:
- Hybrids: 0.04-3mm particle size range.

- Herculite
- Prisma APH
- P-50
- Intended for universal use.
  - Disadvantages: generalized wear.

HISTORY

- Microhybrids:
- Particle size: 0.6-0.7 um.

- Prisma TPH
- Herculite XRV
- Charisma
- Tetric Ceram

HISTORY

- Microhybrids:

- **Excellent physical properties.**
- **Good finishing and polishing characteristics**
- **Relatively non-sticky materials**

  - Do not hold a high polish over time

ADA STATEMENT ON POSTERIOR RESIN-BASED COMPOSITES

- **LITERATURE SUPPORTS THE USE IN:**
  - **PIT AND FISSURE SEALING.**
  - **PREVENTIVE RESIN RESTORATIONS.**
  - **INITIAL CLASS I AND II LESIONS.**
  - **MODERATE-SIZED CLASS I AND II RESTORATIONS.**

ADA STATEMENT ON POSTERIOR RESIN-BASED COMPOSITES

- **CLASS V RESTORATIONS.**
- **RESTORING ESTHETICALLY IMPORTANT AREAS.**
- **IN PATIENTS ALLERGIC OR SENSITIVE TO METALS.**

ADA STATEMENT ON POSTERIOR RESIN-BASED COMPOSITES

- **LITERATURE DOES NOT SUPPORT THE USE IN:**
  - **TEETH WITH HEAVY OCCLUSAL STRESS.**
  - **IN SITES THAT CAN'T BE ISOLATED.**
  - **IN PATIENTS ALLERGIC TO RESIN-BASED COMPOSITES.**

ADA STATEMENT ON POSTERIOR RESIN-BASED COMPOSITES

- **FUTURE RESEARCH SHOULD ADDRESS:**
  - **REDUCTION IN POLYMERIZATION SHRINKAGE.**
  - **IMPROVED DENTIN/ENAMEL BONDING TECHNIQUES.**
  - **IMPROVED PLACEMENT AND INSTRUMENTATION TECHNIQUES.**
  - **IMPROVED CURING METHODS.**

ADA STATEMENT ON POSTERIOR RESIN-BASED COMPOSITES

- **FUTURE RESEARCH SHOULD ADDRESS:**
  - **CONTACT WEAR BEHAVIOR.**
  - **POLYMERIZATION INITIATORS.**
  - **ALTERNATIVE MATRIX SYSTEMS.**
  - **MORE EXTENSIVE RESTORATIONS??**

RESTORATIVE MATERIAL OPTIONS

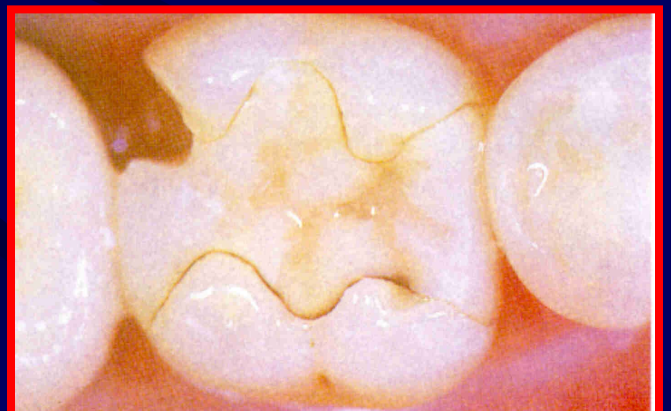
- **HYBRID RESIN**
- **MICROFILL RESIN**
- **HYBRID RESIN INTERNAL & MICROFILL RESIN ON OUTER 1 MM.**

RESTORATIVE MATERIAL OPTIONS

- **PACKABLE RESIN**
- **PACKABLE RESIN WITH MICROFILL ON OUTER 1 MM.**

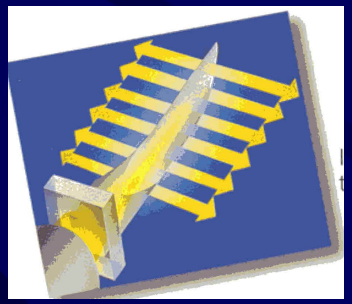
CURRENT PROBLEMS

- **Polymerization shrinkage**
- **Marginal adaptation**
- **Inadequate proximal contact**
- **Microleakage and secondary caries**
- **Post-operative sensitivity.**
- **Occlusal Wear.**



MARGINGAL INTEGRITY

- **Polymerization contraction:**
  - **2-5 volume %.**
  - **Microleakage and stress cracking concerns.**
  - **Compensate:**
    - **small lesions**
    - **incremental placement**
    - **light reflecting wedges**
    - **transparent matrices**



MARGINAL INTEGRITY

- **Water Sorption**
  - **occurs into the resin component of the restorative material.**
  - **Swelling of resin matrix → weakens bond → hydrolysis.**
  - **Incomplete curing: leads to water sorption and hydrolysis.**

MARGINAL INTEGRITY

- **Coefficient of Thermal Expansion**
  - **Microfills much higher than hybrids.**
  - **Creates internal stresses→ marginal gap formation.**
  - **Marginal leakage and/or fracture possible.**
  - **Increasing filler content decreases the difference.**

FRACTURE TOUGHNESS AND ELASTIC DEFORMATION

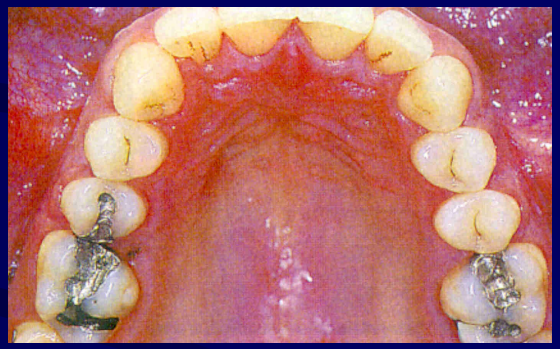
- **Filler Volume**

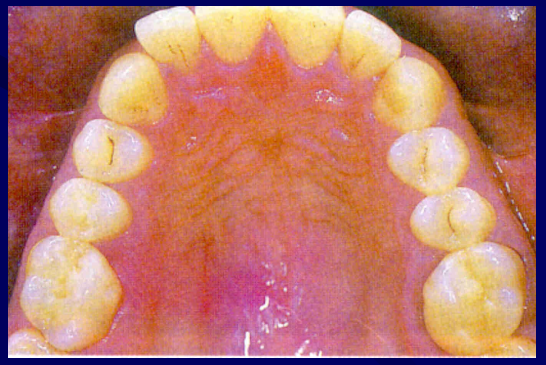
  - **↑ Filler Loading → ↑ Fracture Toughness.**

  - **↑ Filler Loading → ↓ Elastic Deformation.**
    - **Reduces bulk fracture and microcracking.**

CASE SELECTION

- **Lack of longevity**
- **Poor training of dentists**
- **Nature of materials**
- **Occlusion:**
  1. centric stops
  2. CR/CO discrepancies
  3. occlusal scheme





CASE SELECTION

- **Cavity preparation design**
- **Location of margin**
- **Location of restoration**
- **Size of restoration**

CASE SELECTION

- **OCCLUSION CONCERNS/ANTAGONISTIC CUSP:**
  - **GREATLY AFFECTS DEGRADATION OF COMPOSITE.**
  - **INCREASED LOCALIZED WEAR ON THE COMPOSITE SURFACE WITH INCREASED CONTACT AREA.**
  - **INCREASED GENERALIZED WEAR ON THE CONTACT FREE AREA.**
  - **BULK FRACTURE AND MARGINAL DETERIORATION.**

CASE SELECTION

- **ANTAGONISTIC CUSP:**
  - **PRE-OP: USE OF ARTICULATING PAPER.**
  - **DESIGN OUTLINE FORM TO AVOID CONTACT AREA.**
  - **MODIFY THE OPPOSING CUSP TO REDIRECT THE CONTACT AREA AWAY FROM RESTORATION.**
  - **ENAMELOPLASTY OF OPPOSING CUSP TO FLATTEN THE OCCLUSAL LOAD OVER A WIDER AREA.**

NEW MATERIALS

- CONDENSABLE:

DEF: ABLE TO BE COMPACTED OR MADE DENSER BY REDUCING VOLUME.

NEW MATERIALS

- PACKABLE:

  – DEF: ABILITY TO ORGANIZE THE COMPOSITION OF, IN ORDER TO ACHIEVE A FAVORABLE RESULT.

PACKABLE COMPOSITES

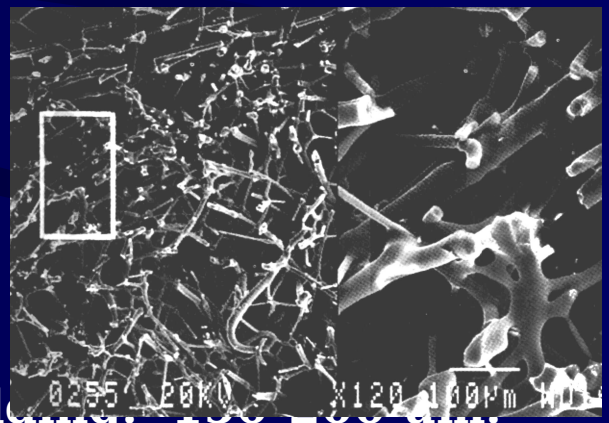
- **RECENTLY INTRODUCED AS AMALGAM ALTERNATIVES.**

- **SUPPLIED:**
  - **UNIT-DOSE, COMPULES OR IN SYRINGES.**

- **HIGHER FILLER LOADING:**
  - **FIBERS**
  - **POROUS FILLER PARTICLES**
  - **IRREGULAR FILLER PARTICLES**
  - **VISCOSITY MODIFIERS.**

POLYMERIC RIGID INORGANIC MATRIX MATERIAL

- **INORGANIC PHASE:**
  - **continuous network or scaffold of ceramic fibers.**
  - **Alumina and silica dioxide fibers.**
  - **Fiber diameter is 2.0 um or smaller.**
  - **Cross-sectional dimension of scaffolding: 150-200 um.**
  - **Silanation is completed with addition of BIS-GMA OR UDMA resin.**



POLYMERIC RIGID INORGANIC MATRIX MATERIAL

- **AFFECTS ON PROPERTIES:**
  - **linear relationship between curing shrinkage of composite and the percentage addition of the fibrous structure.**
  - **Level of incorporation of the ceramic network has a significant effect on the flexural modulus.**
  - **Polymerization shrinkage, wear resistance and marginal deterioration may be affected in a positive way.**

POLYMERIC RIGID INORGANIC MATRIX MATERIAL

- **DEPTH OF CURE:**
  - **Manufacturers claim 2-6 mm.**
  - **Related to the light conducting properties of the individual ceramic fibers.**

PACKABLE COMPOSITES
ADVANTAGES

- **PRODUCE ACCEPTABLE CLASS II RESTORATIONS.**
- **HIGH DEPTH OF CURE POSSIBLE.**
- **REDUCED POLYMERIZATION SHRINKAGE.**
  - **AS LOW AS 2%.**
- **FILLER LOADING: > 80% BY WEIGHT.**
- **BULK FILL TECHNIQUE?:**

PACKABLE COMPOSITES
ADVANTAGES

- **MEDIUM TO HIGH STRENGTH.**
- **HIGH STIFFNESS.**
- **LOW WEAR RATE: 3.5 UM PER YEAR.**
- **MODULUS OF ELASTICITY: SIMILAR TO AMALGAM**

PACKABLE COMPOSITES
DISADVANTAGES

- 1. NEW TECHNIQUE.
- 2. LESS POLISHABLE.
- 3. LIMITED SHADES.
- 4. INCREASED POST-OP SENSITIVITY.
- 5. ↑ SENSITIVITY TO AMBIENT LIGHT.

PACKABLE COMPOSITES

- **RECOMMENDED USES:**
  - **1. CLASS I RESTORATIONS.**
  - **2. CLASS II RESTORATIONS (2-3 SURFACE).**

PACKABLE COMPOSITES
ISSUES

- LINER TO SEAL THE INTERPROXIMAL AREA.
- MARGINAL ADAPTATION.
- INTERPROXIMAL CONTACT.
- SURFACE POLISH.
- BULK-FILL TECHNIQUES.
- LONG-TERM WEAR.
- CLINICAL PERFORMANCE.

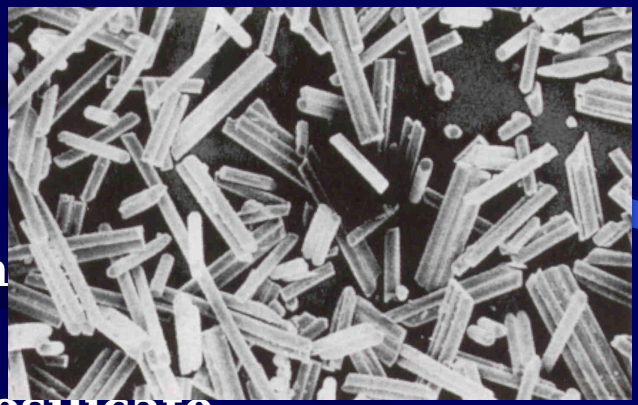
PACKABLE COMPOSITES

- **ALERT:**

  - 1. JENERIC/PENTRON.
  - 2. FLOW-IT! LINER RECOMMENDED
  - 3. 70% FILLER VOLUME.
  - 4. 0.7 UM AVERAGE PARTICLE SIZE.
  - 5. DEPTH OF CURE: 5MM.
  - 6. KIT CONTAINS CARRIER, CONDENSER AND CARVING INSTRUMENTS.
  - 7. VERY GOOD FOR PROXIMAL CONTACTS.

PACKABLE COMPOSITES

- **ALERT:**
  - **microfilamentous glass fiber.**
  - **6 um diameter and 60-80 um in len**
  - **Combined with ground barium borosilicate.**
  - **Filler components are combined with silanated microfine silica.**
  - **Resin matrix: PCDMA; polycarbonate dimethacrylate.**



PACKABLE COMPOSITES

- **GLACIER:**

  - 1. SDI COMPANY.
  - 2. 62% FILLER VOLUME
  - 3. 0.7 UM PARTICLE SIZ
  - 4. DEPTH OF CURE: 2.0 MM.
  - 5. ANTERIOR AND POSTERIOR USES.
  - 6. EASY TO FINISH AND POLISH.

PACKABLE COMPOSITES

- **3M FILTEK P-60:**
  - **1. 3M DENTAL COMPANY.**
  - **2. HIGH DENSITY RADIOPAQUE COMPOSITE.**
  - **3. VITREBOND LINER RECOMMENDED.**
  - **4. 61% FILLER VOLUME.**
  - **5. 0.6 UM PARTICLE SIZE.**
  - **6. DEPTH OF CURE: 2.5 MM.**
  - **7. SHADES A3,B2,C2 AVAILAB**

PACKABLE COMPOSITES

- **PRODIGY CONDENSABLE:**

  - 1. KERR COMPANY.
  - 2. REVOLUTION LINER.
  - 3. 8 DIFFERENT SHADES
  - 4. 80% FILLER VOLUME.
  - 5. 0.6 UM PARTICLE SIZ
  - 6. DEPTH OF CURE: 5 MM.
  - 7. GOOD RESISTANCE TO PRESSURE.

PACKABLE COMPOSITES

- **PYRAMID:**

  - 1. BISCO DENTAL PRODUC
  - 2. AELITE FLO LINER.
  - 3. 2.2 UM PARTICLE SIZE.
  - 4. DEPTH OF CURE: 2MM.
  - 5. DENTIN AND ENAMEL SHADES.
  - 6. NOT SENSITIVE TO AMBIENT LIGHT.
  - 7. LESS PACKABLE MATERIAL.

PACKABLE COMPOSITES

- **SOLITAIRE:**
  - **1. HERAEUS KULZER COMPANY.**
  - **2. 67% FILLER VOLUME.**
  - **3. RELEASES FLUORIDE.**
  - **4. 2-20 UM PARTICLE SIZE.**
  - **5. DEPTH OF CURE: 3.5 MM.**
  - **6. Filler: quartz and barium aluminoborofluorosilicate glass a fluorosilicate glass.**
  - **7. Resin: is a vitroid Polyglas.**

PACKABLE COMPOSITES

- **SUREFIL:**

  - **1. DENTSPLY/CAULK.**
  - **2. DYRACT FLOW LINER.**
  - **3. 66% FILLER VOLUME.**
  - **4. 0.8 UM PARTICLE SIZE.**
  - **5. DEPTH OF CURE: 5 MM.**
  - **6. FILLER: Barium fluoroaluminobo**
    fumed silica.
  - **7. Resin: Bis-GMA, TEGDMA, and ethoxylated bisphenol-**
    A-dimethacrylate

PACKABLE COMPOSITES

- **1-YEAR CLINICAL STUDY:**
  - **1. SOLITAIRE CONDENSAB LE COMPOSITE.**
  - **2. SEVEN SENIOR DENTAL STUDENTS PLACED OVER**
    200 POSTERIOR RESTORATIONS SUPERVISED.
  - **3. EVALUATED:**
    - **EASE OF PLACEMENT**
    - **PACKABILITY**
    - **SURFACE FINISH**
    - **INTEPROXIMAL CONTACTS**
    - **ESTHETICS.**
    - **POST-OP SENSITIVITY**

PACKABLE COMPOSITES

- **70 RESTORATIONS RECALLED AT 1-YEAR**
  - **EVALUATION:**
    - **RESISTANCE TO FX**
    - **MARGINAL STAIN**
    - **PT SATISFACTION**
    - **ESTHETICS**
    - **RESISTANCE TO WEAR**
    - **OVERALL RATING**
    - **RESULTS: 4.0-5.0 RATING IN EACH CATEGORY.**

      1 PT HAD SENSITIVITY AT PLACEMENT

      3 RESTORATIONS REQUIRED REPAIR

PACKABLE COMPOSITES

- **Perry, et al, 1999: One-Year Clinical Evaluation of SureFil Packable Composite.**
  - **Evaluated 25 Class II Restorations in 1st and 2nd molars.**
  - **Dentin bonding agent only, no flowable first increment.**
  - **Bulk fill in 3-5 mm increments with 40 second curing time.**
  - **PVS impressions were taken to evaluate wear rates.**

PACKABLE COMPOSITES

- **Perry, et al, 1999: One-Year Clinical Evaluation of SureFil Packable Composite.**
  - **Retention, color match, marginal integrity, leakage, wear, surface texture, surface staining, post-op sensitivity, maintenance of interproximal contact, and secondary caries.**
  - **24 restorations recalled at 3,6, 9 months: all alpha grading in all categories.**
  - **3 Bravo scores at 1 year for surface staining in smokers.**
  - **Wear rate: 2.3 um of wear at 1-year interval.**

FLOWABLE COMPOSITES

- LOW-VISCOSITY COMPOSITES.
- LOWER FILLER CONTENT.
- IDEAL FOR CERVICAL LESIONS.
- IDEAL FOR NON-STRESS BEARING AREAS.
- IDEAL FOR FIRST INCREMENT IN CLASS II COMPOSITES.

FLOWABLE COMPOSITES

- **ADVANTAGES:**
  - **1. SYRINGEABLE.**
  - **2. DISPENSED DIRECTLY INTO CAVITY.**
  - **3. ADEQUATE STRENGTH.**
  - **4. LOW STIFFNESS: ABFRACTION BENEFIT.**
  - **5. HIGHLY POLISHABLE.**

FLOWABLE COMPOSITES

- **DISADVANTAGES:**
  - **1. HIGHER POLYMERIZATION SHRINKAGE.**
  - **2. GREATER POTENTIAL FOR MICROLEAKAGE.**
  - **3. LOW WEAR RESISTANCE.**

FLOWABLE COMPOSITES

- **Aelite-flo:**
  - 1. **Bisco Company.**
  - 2. **0.7 um particle size.**
  - 3. **12 shades available.**
  - 4. **No fluoride release.**
  - 5. **Flows and reshapes easily**

FLOWABLE COMPOSITES

- Flow-It!
  - 1. Jeneric Pentron Incorpora
  - 2. 1.0 um particle size.
  - 3. 53 volume % filler.
  - 4. 9 shades available.
  - 5. Fluoride release.
  - 6. Good intermediate mat

FLOWABLE COMPOSITES

- **Revolution:**

  - 1. E & D Company.
  - 2. 1.7 um particle siz
  - 3. 43 volume % filler.
  - 4. No Fluoride release.
  - 5. Excellent flow and adaptation.
  - 6. Useful for splinting, porcelain repair, and as sealants.

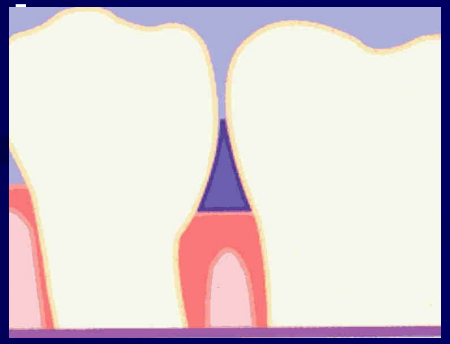
CLINICAL TECHNIQUE

ISOLATION RECOMMENDATIONS

- **Rubber Dam Isolation is Mandatory:**
  - **Failure to maintain a dry field will result in clinical failure.**
  - **Prevention of moisture contamination and protection of gingival tissues is of paramount importance.**
  - **Select shade before rubber dam application.**
    - **Dentin shade up to the DEJ level.**
    - **Incisal or enamel shade for final increment.**

PRE-WEDGING

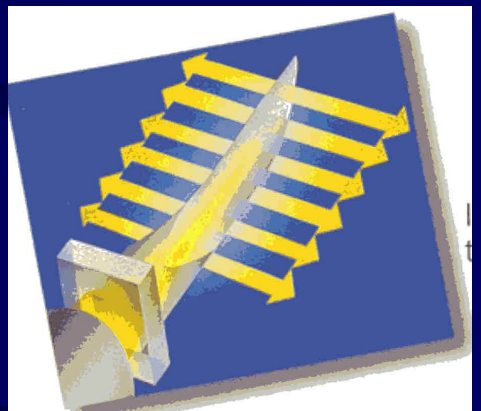
- **Gains interproximal separation facilitate tight contact area.**



- **INITIAL: 90 um movement.**
- **AFTER 30 SECONDS:**
  - **30 um is lost.**
- **90% RECOVERY: within 30 seco removal of wedge.**

PRE-WEDGING

- **CURE THROUGH REFLECTIVE WEDGES:**
  - **REFLECT 90% OF LIGHT AT A 90 DEGREE ANGLE TOWARD THE PROXIMAL SURFACE.**
  - **LATERAL REFLECTING WEDGES WERE SUPERIOR TO TRANSPARENT NON-REFLECTING WEDGES IN INDUCING SUPERIOR MARGINS.**



CAVITY PREPARATION

- **ADHESIVE PREPARATION FOR POSTERIOR COMPOSITES**

- **DIFFERS FROM TRADITIONAL AMALGAM PREPARATIONS IN MANY WAYS.**

CAVITY PREPARATION

- **PREPARATION IS SHALLOWER.**
- **RETENTION IS PROVIDED THROUGH BONDING.**

CAVITY PREPARATION

- **PREPARATION IS NARROWER:**
  - **1. LESS OCCLUSAL CONTACT AREA.**
  - **2. REDUCES WEAR.**
  - **3. DECREASES AFFECT OF POLYMERIZATION SHRINKAGE.**
  - **4. IMPROVED MARGINAL INTEGRITY.**
  - **5. LESS CUSPAL DEFLECTION.**

CAVITY PREPARATION

- **PREPARATION HAS ROUNDED INTERNAL LINE ANGLES:**
  - **1. CONSERVES TOOTH STRUCTURE.**
  - **2. DECREASES STRESS CONCENTRATION.**
  - **3. ENHANCES RESIN ADAPTATION DURING PLACEMENT.**

CAVITY PREPARATION

- **NO EXTENSION FOR PREVENTION:**
  - **1. OCCLUSAL SURFACE IS INVADED ONLY IF CARIES DICTATES IT.**
  - **2. NO INCREASED RESISTANCE TO FRACTURE BY INCLUDING THE OCCLUSAL SURFACE IN THE PREP VERSUS A SLOT PREPARATION.**
  - **3. TREAT ADJACENT PITS AND FISSURES WITH SEALANTS.**

PROXIMAL BOX PREPARATION CONCERNS

- **SLOT PREPARATIONS:**
  - **MECHANICAL RETENTION ISN'T IMPORTANT.**
  - **DON'T EXTEND THE PREPARATION BEYOND THE MARGINAL RIDGE BY MORE THAN 2 MM.**

GINGIVAL MARGIN CONCERNS

- **SLOT PREPARATION OR CONVENTIONAL CLASS II PREP:**
  - **GINGIVAL FLOOR EXTENDED ONLY TO DEPTH OF CARIOUS LESION.**
  - **CONSERVE ENAMEL FOR BONDING AND MICROLEAKAGE PREVENTION.**

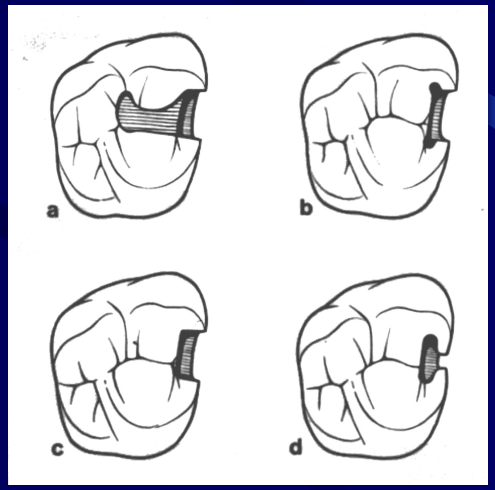
OCCLUSAL MARGIN OF PREPARATION

- **BEVELED OCCLUSAL CAVOSURFACE MARGIN:**
- **SIGNIFICANTLY INCREASES THE WEAR RATE COMPARED TO CONVENTIONAL BUTT JOINT CAVOSURFACE MARGINS.**
- **WHY? THE BU-LI DIMENSION IS INCREASED AND INFLUENCES THE AFFECT OF THE ANTAGONISTIC CUSP.**

DOES PREP DESIGN MAKE A DIFFERENCE?

- **Summit, Della Bona & Burgess, 1994:**
  - **The Strength of Class II Composite Resin Restorations as Affected by Preparation Design.**
  - **What load was required at the marginal ridge to produce failure in composite resigns with these differing prep designs?**

  - **RESULTS:**
  - **Group A: Mean of 438 N.**
  - **Group B: Mean of 383 N.**
  - **Group C: Mean of 297 N.**
  - **Group D: Mean of 281 N.**
  - **Mean failure loads of Group A & B were not statistically different.**



DOES INTRAORAL LOCATION MAKE A DIFFERENCE?

- **Leinfelder et al, Quantitative Wear Measurement of Post Composite Resins. Dent Mater 1986;2:263-286.**
  - **RESULTS:**
  - **Composites wear more rapidly on molars than they do on premolars or anterior teeth regardless of composite type.**
  - **The larger the BU-LI width, the greater the amount of wear.**
  - **Consider other restorative materials in molar situations.**

PULPAL PROTECTION

- **Postoperative sensitivity concerns**:
  - **effects of polymerization contraction and/or marginal leakage with bacterial invasion.**
  - **Hermetically seal the dentin with your choice of dentin bonding agent material.**
  - **Place a light curable resin modified glass ionomer cement that has the fluoride releasing properties you may desire.**

DENTIN/ENAMEL BONDING

- **Another Clinical Decision to Make:**
  - **your choice of one of the currently available dentin bonding agents following the manufacturer's instructions.**

CRITERIA FOR MATRICES

- **RE-ESTABLISH CONTOUR**
- **FORM POSITIVE CONTACT**
- **SEAL GINGIVAL MARGIN**
- **ALLOW ADEQUATE BULK OF MATERIAL**
- **LIMITED THICKNESS**
- **PRODUCE SMOOTH SURFACE**

CRITERIA FOR MATRICES

- **PERMIT NON-DISRUPTIVE WITHDRAWAL**
- **MUST AVOID TOOTH DISTORTING PRESSURES**
- **MUST BE EASY TO PLACE**
- **ALLOW FOR A VARIETY OF RESTORATIVE MATERIALS**

MATRIX SYSTEMS

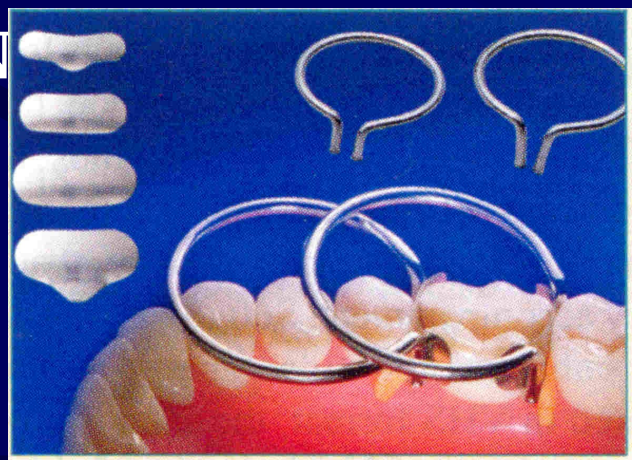
- **PALODENT SECTIONAL MATRIX**
  - **1. Darway, Incorporated.**
  - **2. BiTine Ring and BiTine.ii Ring.**
  - **3. Sectional matrix sizes**

MATRIX SYSTEMS

- **PALODENT SECTIONAL MATRIX**
  - **4. Standard matrix: 0.002-inch.**
  - **5. Mini-matrix: 0.0015-inch.**

MATRIX SYSTEMS

- **COMPOSI-TIGHT SECTIONAL MATRIX**
  - **1. GARRISON DENTAL SOLUTIONS.**
  - **2. TWO G-RING RETAINERS.**
  - **3. STANDARD AND EXTEN**



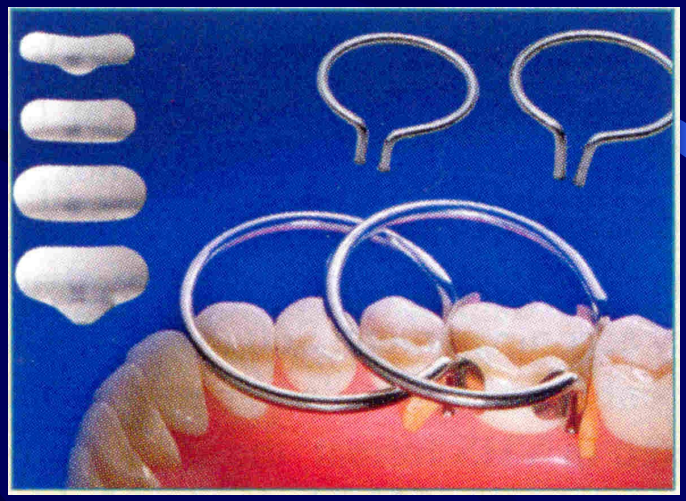
MATRIX SYSTEMS

- **COMPOSI-TIGHT SECTIONAL MATRIX**

  - **4. FOUR SIZES OF SECTIONAL MATRIX.**

  - **5. RUBBER DAM FORCEPS.**

  - **6. BURNISH MATRIX.**



MATRIX SYSTEMS

- **HO BAND METAL MATRIX:**
  - **1. YOUNG DENTAL COMPANY.**
  - **2. DEAD SOFT METAL MATRIX.**
  - **3. 0.001-INCH THICKNESS.**
  - **4. USES A TOFFLEMIRE HOLDER.**

MATRIX SYSTEMS

- **AUTOMATRIX II SYSTEM**
  - **1. SINGLE-USE SELF CONTAINED UNITS.**
  - **2. NO RETAINER NEEDED**
  - **3. TRANSPARENT BANDS AVAILABLE.**

MATRIX SYSTEMS

- **AUTOMATRIX II SYSTEM**
  - **4. METAL BANDS:**
    0.0015-INCH OR
    DEAD- SOFT O.001-INC
  - **5. COMBINATION BAND**

MATRIX SYSTEMS

- **MICROBAND MATRIX SYSTEM**
  - **1. Dental Innovations.**
  - **2. Used in standard Tofflemire**
  - **3. Contact area is 0.0004-0.000**

MATRIX SYSTEMS

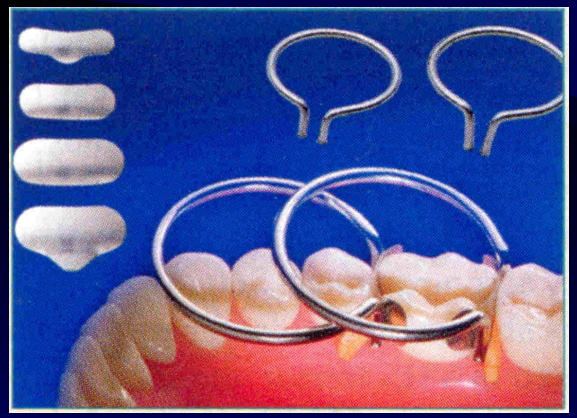
- **MICROBAND MATRIX SYSTEM**
  - **4. Can be used for several adjacent composites.**
  - **5. Standard, MUDL, DUML.**

MATRIX SYSTEMS

- **SUPERMAT SYSTEM**
  - **PREMIERE DENTAL PRODUCTS COMPANY**
  - **MYLAR: .075 MM THICKNESS.**
  - **METAL: .038 MM THICKNESS.**
  - **HANDY BAND: COMBINATION.**

MATRIX SYSTEM APPLICATIONS

- **Multiple adjacent tooth preparations.**



COMPOSITE PLACEMENT INSTRUMENTS

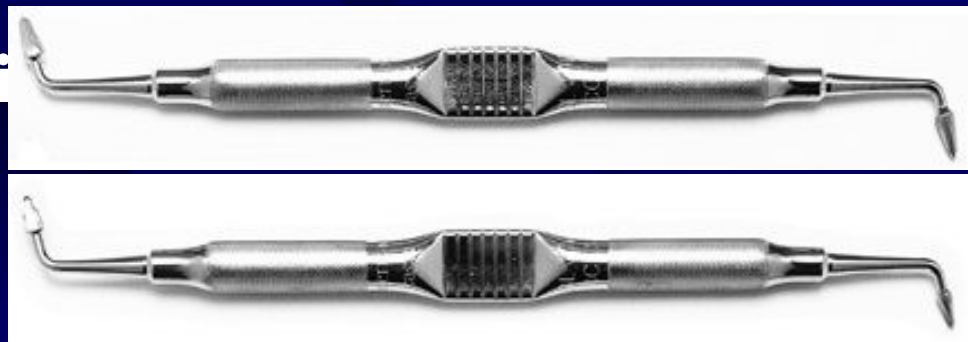
- **PREMIERE DENTAL PRODUCTS, COMPANY**
- **NON-STICK ANODIZED ALUMINUM CMI 1/2**

- **PLASTIC STERILIZABLE:**
  - **POSTERIOR: 3 DESIGNS.**

Composite Placement Instruments
Flexible White Plastic Sterilizable to 285°F (140°C)
POSTERIOR COMPOSITE INSTRUMENTS
Posterior:
Three designs, round rectangular and rhomboid, provide easy access to Class I and Class II Restorations.
9061271
Anterior:
Five assorted designs. They are excellent for carrying, condensing and carving.
9061301

CONTACT-FORMING INSTRUMENTS

- **BELVEDERE CCF**
  - **American Eagle Instruments, Incorporated.**
  - **Double-ended metal hand instruments with conical tips with hatchet and hoe forms on opposite ends.**
  - **Small and large si**



CONTACT-FORMING INSTRUMENTS

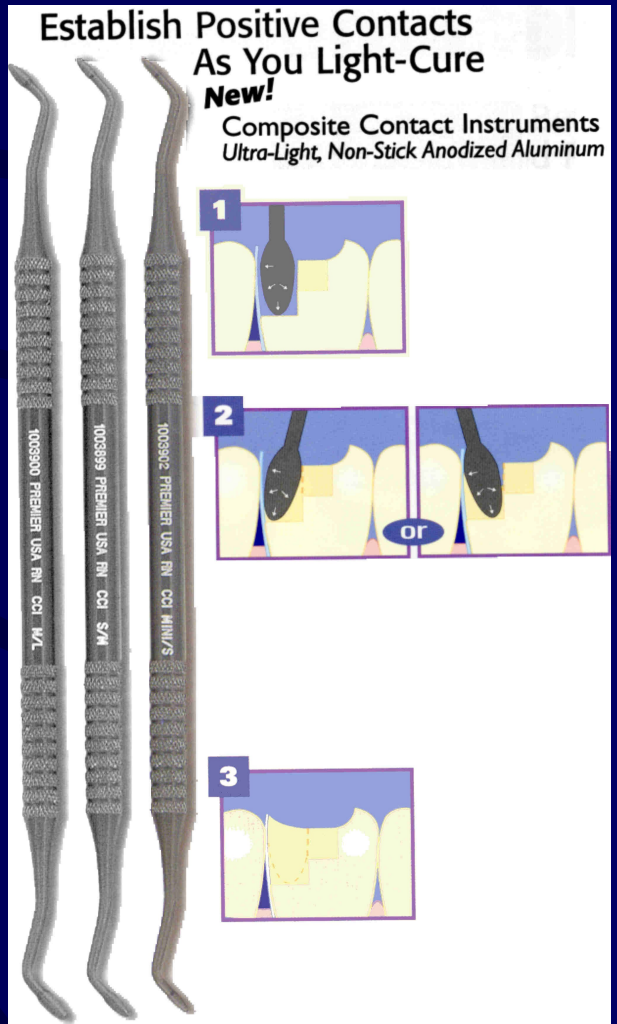
- **BELVEDERE CCF**
  - **Place composite resin into box form.**
  - **Press Belvedere former into resin, wedge or twist instrument to force resin against matrix band & tooth preparation axial wall.**
  - **Cure resin & remove instrument. Fill void left by instrument with added resin, light cure and finish.**

CONTACT-FORMING INSTRUMENTS

- **LIGHT TIP**
  - **Denbur Incorporated.**
  - **Cone-shaped non-sticking transparent tip that fits onto curing light guides.**
  - **Four sizes available.**
  - **Pack resin into box form. Press Lig into resin, wedging it against axial and light cure. Remove Light-Tip a fill void with new material.**

CONTACT-FORMING INSTRUMENTS

- **COMPOSITE CONTACT INSTRUMENT**
  - **PREMIERE DENTAL PRODUCTS COMPANY**
  - **NON-STICK ANODIZED ALUMINUM**
  - **INSTRUMENT IS USED TO TORQUE AGAINST MATRIX BAND FOR DESIRED CONTACT.**



COMPOSITE PLACEMENT TECHNIQUES

- **SEGMENTAL PLACEMENT: < 5.0 MM.**
  - **1. FLOWABLE RESIN (0.5-1.0 MM LAYER)**
  - **2. DENTIN SHADE OF PACKABLE RESIN. NO MORE THAN 3.0-3.5 MM INCREMENTS.**
  - **3. TINT PLACEMENT (OPTIONAL).**
  - **4. ENAMEL SHADE (UNIVERSAL HYBRID).**

COMPOSITE PLACEMENT TECHNIQUES

- **SEGMENTAL PLACEMENT: > 5.0 MM.**

  - **1. FLOWABLE RESIN (0.5-1.0 MM THICK)**
  - **2. DENTIN SHADE: 1ST LAYER.**
  - **3. DENTIN SHADE: 2ND LAYER.**
  - **4. TINT PLACEMENT: (OPTIONAL)**
  - **5. ENAMEL SHADE: UNIVERSAL HYBRID**

COMPOSITE PLACEMENT TECHNIQUES

- **BULK FILL TECHNIQUE:**
  - **A MAJOR CLAIM OF PACKABLE COMPOSITE MANUFACTURERS.**
  - **Yap, 2000: Effectiveness of Polymerization in Composite Restoratives Claiming Bulk Placement: Impact of Cavity Depth and Exposure Time.**
  - **Ariston pHc and Surefil: claims by manufacturer was tested regarding sufficient curing to 4-5 mm depths with 40 s VLC.**

COMPOSITE PLACEMENT TECHNIQUES

- **BULK FILL TECHNIQUE:**
  - **RESULTS:**
  - **A minimum hardness ratio of 0.8 was used.**
  - **The difference in Knoop Hardness that can be tolerated when comparing the occlusal and apical surfaces of the resin.**
  - **Increments should be no greater than 2mm to obtain a uniform and maximum cure.**
  - **Increase cavity depth resulted in decreased effectiveness of polymerization for all exposure times.**
  - **Increased exposure time resulted in an increased hardness ratio and effective polymerization at depths of 3-4 mm.**

MARGINAL SEAL OF CLASS II COMPOSITE RESTORATIONS

- **Payne, 1999:**
  - **Tested flowable composite resin versus injectable glass ionomer in terms of microleakage at the cavosurface of proximal Class II restorations in permanent teeth in-vitro.**

  - **Group 1: Optibond + Tetric Flow.**
  - **Group 2: Optibond + Fuji II LC.**
  - **Group 3: Fuji II LC w/o DBA.**

MARGINAL SEAL OF CLASS II COMPOSITE RESTORATIONS

- **Payne, 1999:**
  - **Results:**
  - **Group 1 outperformed Group 2.**
  - **Group 1 outperformed Group 3.**
  - **Group 2 outperformed Group 3.**

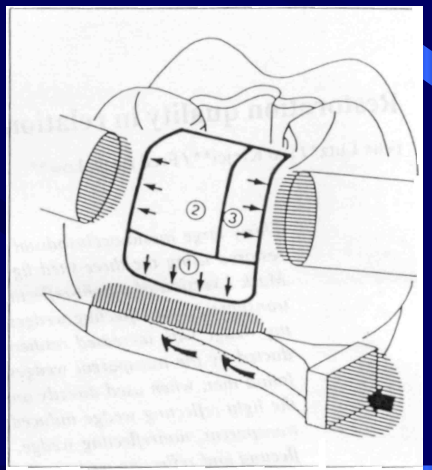
  - **Group 1: lowest microleakage scores.**
  - **Group 2: bond existed but microleakage within the glass ionomer itself occurred.**
  - **Group 3: significant microleakage at the material/tooth interface, microgaps within the glass ionomer and lack of retention of the restoration.**

THREE-SITED LIGHT CURING TECHNIQUE

- **FIRST INCREMENT:**
  - CURED THROUGH THE LIGHT-REFLECTING WEDGE IN A GINGIVAL-PROXIMAL DIRECTION.

- **LARGER 2ND and 3RD INCREMENT:**
  - CURED FROM BUCCAL AND LINGUAL.
  - ENSURES SHRINKAGE VECTORS TOWARD THE CAVITY MARGINS.

- **FINAL INCREMENT:**
  - ADDED TO THE OCCLUSAL ASPECT.



THREE-SITED LIGHT CURING TECHNIQUE

- **RESULTS (Lutz, Krejci, & Barbakow, 1992):**
  - **Lateral reflecting wedges were superior to the transparent, non-reflecting wedges in inducing superior margins.**
  - **Lingering contraction stresses after curing were primarily located in the final occlusal increment.**
  - **Good marginal adaptation can be obtained in the Class II box preparation.**
  - **Optimal interproximal curing with a three-sited technique is essential, BUT DO NOT USE TRANSPARENT, NON-REFLECTING WEDGES.**

FINISHING PROCEDURES

- 12-B BLADE TO REMOVE INTERPROXIMAL GINGIVAL EXCESS.
- FINE-DIAMOND FINISHING STRIPS.
- ALUMINUM OXIDE FINISHING DISCS.
- CARBIDE FINISHING BURS.

FINISHING PROCEDURES

- **WISNIEWSKI et al, 1997:**
  - **in vivo study comparing the effect of fine finishing diamonds versus fluted carbide finishing burs using SEM analysis and indirect wear analysis.**
  - **Technique 1: occlusal index, photopolymerization and no rotary finishing completed.**
  - **Technique 2: photopolymerization and dry finishing with fluted carbide finishing burs.**
  - **Technique 3: photopolymerization, wet finishing with fluted finishing burs and wet finishing with fine diamonds.**

FINISHING PROCEDURES

- **RESULTS:**
  - **no significant difference between groups 1 and 2 at 6 months and 1 year with regard to wear rates.**
  - **Group 3 had increased wear rates of 53% (6 mths) and 59% at (1 year).**
  - **SEM: for group 3 showed resin matrix crazing and filler particle loss.**
  - **Bottom line: wet fine diamonds can adversely affect the wear resistance of posterior composite resins compared to dry finishing with 12-fluted carbide burs.**

FINISHING PROCEDURES

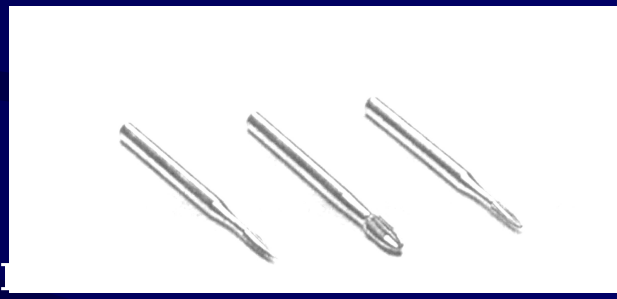
- **Jung, 1997:**
  - **Evaluated the influence of eight diamonds, five tungsten carbide finishing burs, and one ceramically coated finishing instrument on the surface of a small particle hybrid composite and to evaluate their cutting efficiencies.**
  - **Results:**
  - **finishing diamonds had highest cutting efficiency but roughest composite surfaces.**
  - **Tungsten carbide burs produced the smoothest surface but had poor cutting efficiency.**

FINISHING PROCEDURES

- **Jung, 1997:**
  - **Bottom line:**
  - **A combination of a finishing diamond with 15-40 um particle size for the initial gross removal and contouring followed by a tungsten carbide finishing bur for finishing the surface produced the best results overall.**

RECOMMENDED FINISHING PROCEDURE

- **STEP 1:**
  - **12-Fluted carbide burs:**



  - **7406: occlusal anatomy.**
  - **7901: marginal ridge, proximal e**
  - **7801: refine occlusal anatomy.**

  - **Use these burs dry, low-end of hig range with light touch.**
  - **Minimize cavosurface margin cont**
  - **Sof-flex discs: interproximal areas**

RECOMMENDED FINISHING PROCEDURE

- **STEP 2:**
  - **Intermediate finishing:**
  - **bonded elastic or rubber abrasiv**
  - **Enhance finishers: minimally abrasive to adjacent enamel.**
  - **Aluminum-oxide bonded abrasives dry with light to moderate pressu to clear the field and dissipate he**

RECOMMENDED FINISHING PROCEDURE

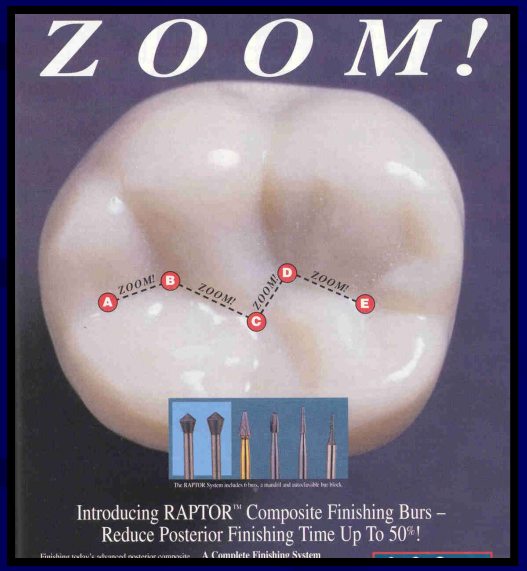
- **STEP 3:**
  - **aluminum oxide-containing composite polishing paste**

  - **Prisma-gloss (Dentsply/Caulk) or Enamelize (Cosmedent).**
  - **Use Enhance polishing cups and dry/wet techniq**

  - **Proximal Areas: disc-shaped felt devices.**
  - **Super Snap Buff Disc (Shofu) or Flexibuff (Cosmedent)**

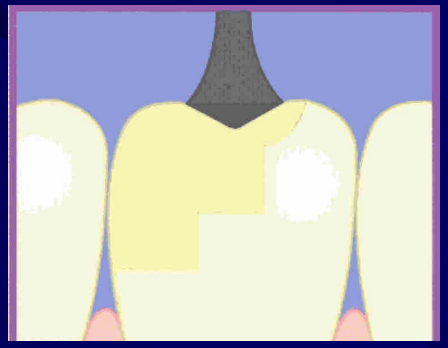
FINISHING PROCEDURES

- **Raptor**



- **Profin**

- **Brasseler**



POLISHING PROCEDURES

- **COMPOSITE SURFACE SEALANT USE:**

COMPOSITE SURFACE SEALANTS

- **DICKINSON, LEINFELDER, 1993: Assessing the Long-Term Effect of a Surface Penetrating Sealant.**
  - **62 samples involving Class I and Class II Composite Resins.**
  - **Bisfil I composite resin and Fortify Surface Sealant were used.**
  - **Evaluation: color matching, staining, secondary caries, wear, marginal integrity, and surface texture.**
  - **Baseline, 6 months, 1,2,3,5 year evaluations.**

COMPOSITE SURFACE SEALANTS

- **RESULTS:**

- **Although the wear rates were lower for the sealed group throughout the study, the effect dissipated after 2 years.**

- **Marginal integrity: at 5 years, 92% of sealed group rated alpha, compared to 67% of unsealed group.**

- **BOTTOM LINE:**
- **composite surface sealants improve marginal integrity and wear rates for posterior composite resins.**
- **consider reapplication of surface sealant at 1-year recall.**

COMPOSITE SURFACE SEALANTS

- **Kawai and Leinfelder, 1993:**
  - **Effect of Surface-Penetrating Sealant on Composite Wear.**
  - **Wear in posterior composites is shown clinically as multiple microcracks.**
  - **These defects range from 3-15 um or more in length.**
  - **Are these microcracks a natural part of degradation or generated by the finishing procedures.**

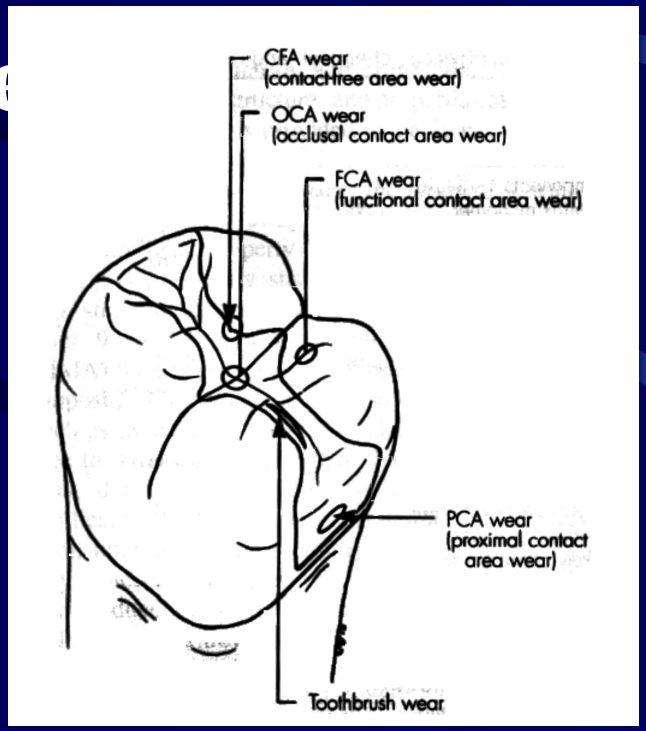
COMPOSITE SURFACE SEALANTS

- **Kawai and Leinfelder, 1993:**
  - **2 posterior composites (Bisfil P, Occlusin) have mean particle size >1 um and 2 posterior composites (Herculite XR, Prisma APH) have mean particle size ≤ 1 um.**
  - **Surface penetrating sealant (Fortify) was used.**

  - **RESULTS:**
  - **the effectiveness of the surface-penetrating sealant depends upon the mean particle size.**
  - **40-50% reduction in wear for group with >1 um particle size. The wear of submicron sized filler particles wasn't effected.**
  - **Enhanced marginal integrity was achieved in all groups.**

WEAR RESISTANCE

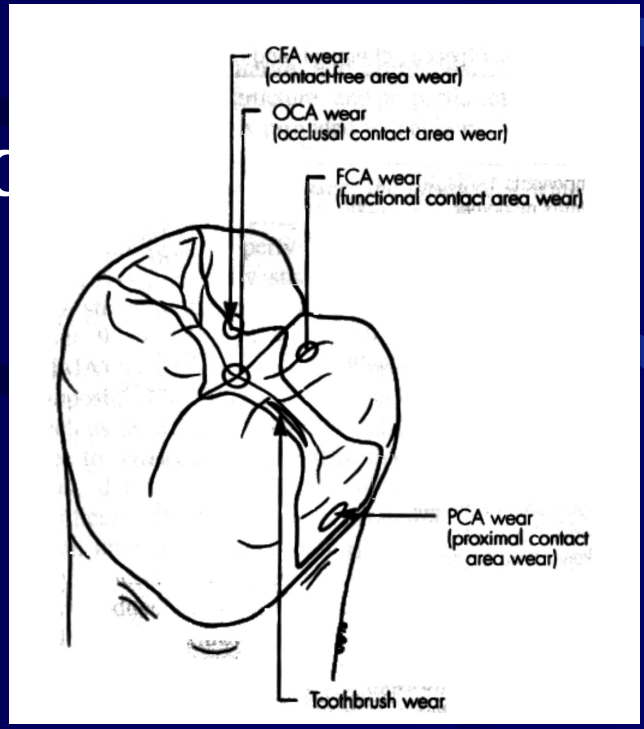
- **CFA: Contact free area wear.**
- **Wear by food particle**



WEAR RESISTANCE

- **OCA: occlusal contact area wear.**

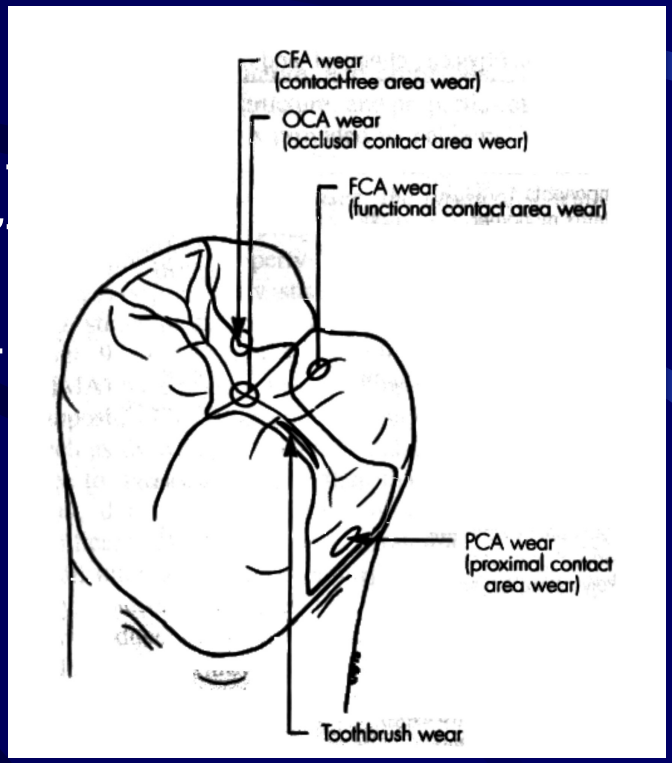
- **Wear by tooth contac**
  centric.



WEAR RESISTANCE

- **FCA: functional contact area wear.**

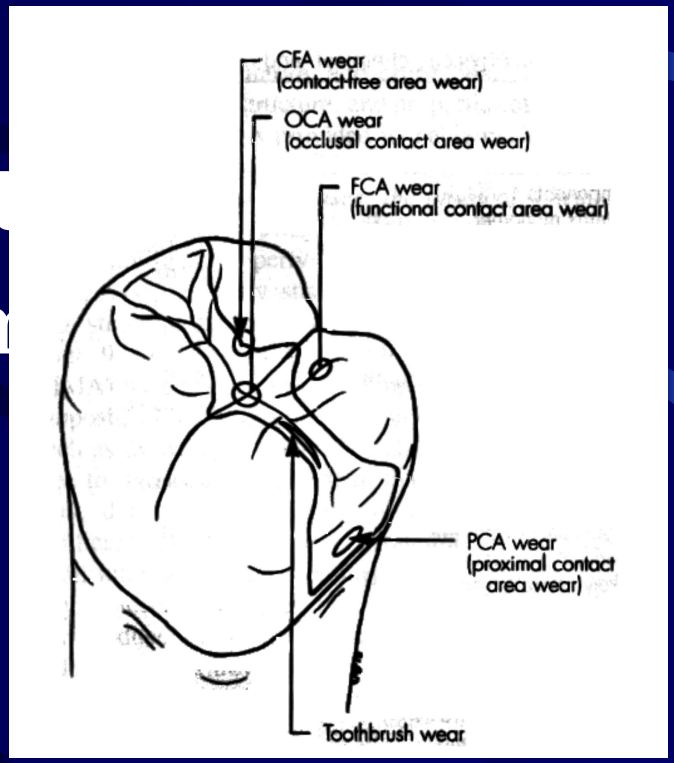
- **Wear by sliding toot**
  contact in function



WEAR RESISTANCE

- **PCA: proximal contact area wear.**

- **Wear by rubbing of t**
  contact interproxim



WEAR RESISTANCE

- **MICROFRACTURE THEORY:**

- **HIGH MODULUS FILLER PARTICLES ARE COMPRESSED ONTO THE ADJACENT MATRIX DURING OCCLUSAL LOADING**

- **THIS CREATES MICROFRACTURES IN THE WEAKER ADJACENT MATRIX.**

WEAR RESISTANCE

- **MICROFRACTURE THEORY**

- **RESULT: THESE MICROFRACTURES BECOME CONNECTED AND SURFACE LAYERS OF THE COMPOSITE EXFOLIATE.**

WEAR RESISTANCE

- **HYDROLYSIS THEORY**

- **THE SILANE BOND BETWEEN THE RESIN MATRIX AND FILLER PARTICLE IS HYDROLYTICALLY UNSTABLE AND BECOMES DEBONDED.**

- **THIS BOND FAILURE ALLOWS FOR SURFACE FILLER PARTICLES TO BE LOST.**

WEAR RESISTANCE

- **CHEMICAL DEGRADATION THEORY**
- **MATERIALS FROM FOOD AND SALIVA ARE ABSORBED INTO THE MATRIX**
- **CAUSES DEGRADATION AND SLOUGHING FROM THE SURFACE.**

IN VITRO WEAR DEVICE
FOR DETERMINING POSTERIOR COMPOSITE WEAR

- **BASED ON THREE-BODIED WEAR:**
  - **THREE BODIED WEAR: type of wear generated by food bolus during mastication.**
  - **TWO BODIED WEAR: direct contact wear without the presence of a food bolus.**

IN VITRO WEAR DEVICE
FOR DETERMINING POSTERIOR COMPOSITE WEAR

- **WEAR TESTING:**
  - **posterior composite resins.**
  - **Castable ceramic.**
  - **Amalgam.**
  - **Unsalinated composite resin.**
  - **400,000 cycles of wear.**
  - **Replicas of restored surfaces examined under SEM.**

IN VITRO WEAR DEVICE
FOR DETERMINING POSTERIOR COMPOSITE WEAR

- **RESULTS:**
  - **CONSIDERABLE DIFFERENCES IN WEAR OF MATERIALS TESTED.**
  - **RESULTS WERE WITHIN THE RANGE OF CONTROLS.**
  - **INVITRO RESULTS COMPARED WELL WITH WEAR VALUES FROM ONGOING CLINICAL STUDIES.**
  - **REPLICAS REVEALED SIMILAR WEAR PATTERNS TO THOSE GENERATED FROM CLINICAL SETTING.**

IN VITRO WEAR DEVICE
FOR DETERMINING POSTERIOR COMPOSITE WEAR

- **BOTTOM LINE:**
  - **IN VITRO TESTING DEVICE IS A CAPABLE PREDICTOR OF LONG-TERM CLINICAL WEAR.**
  - **RESULTS OBTAINED AFTER 92 HOURS OF TESTING CORRELATE CLOSELY WITH THOSE OBTAINED AFTER THREE YEARS OF CLINICAL TESTING.**

DESIRABLE PROPERTIES AND HANDLING CHARACTERISTICS FOR POSTERIOR RESINS

- HEAVY MATERIAL THAT CAN BE PUSHED INTO THE PROXIMAL BOX.
- MATERIAL STAYS IN PLACE AGAINST BURNISHED CONTACT.
- NON-STICKY MATERIAL.
- NON-SLUMPING MATERIAL.
- MATERIAL FINISHES WELL.
- MATERIAL HAS A HIGH DEPTH OF CURE
- ARE WE THERE YET???

QUESTIONS